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Indigenous Communities in the Arctic Change in Socio-Economic and Environmental Perspective

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Abstract

In recent decades, the world has undergone significant changes in the environment, which have led not only to economic losses but also to a deterioration in the quality of human life, a change in the usual way of life. The Arctic today is in the focus of geopolitical and economic interests, the impact on the region of global warming. The ice retreats giving humanity new transport corridors, thereby attracting new participants from non-Arctic countries. Japan, China, and South Korea are interested in developing the Northern Sea Route for the delivery of goods and the development of economic ties between Europe and Asia. However, the importance of this route is also connected with transportation of hydrocarbons and other minerals extracted in the Arctic. Industrial development is a priority for the Arctic countries, and climate change makes remote areas of the subsoil more accessible. Especially this issue should be considered for Russia, where the development of the Arctic is experiencing a third wave and this process affects the interests of state, business, and population including indigenous communities, whose number is more twice than in the rest of the world (2.8 million residents in the Russian Arctic with approximately 4 million people in the Arctic totally).

Keywords: indigenous community, Arctic, climate change, territories of traditional nature use, sustainable development, Russia, Yakutia

1. Introduction

At the beginning of this century, the topic of global climate change became of particular relevance for the regions of the Arctic and the North. This problem is actual in modern conditions. The Arctic climate changes faster than any other part of the world; this is the only highly integrated system in this belt; changes in the Arctic will have a big impact on other parts of the world. The Arctic will become an increasing center of world attention. Over the past few decades, the average annual temperature due to an increase in the average winter temperature in the Arctic has grown two times faster than elsewhere, causing the melting of sea ice and permafrost and a reduction in the snow period. The consequences of global warming in the Arctic are already obvious and numerous. Modern climate changes significantly affect coastal communities, species diversity of animals and plants, human health and welfare, as well as the economy and infrastructure of the Arctic regions. Global warming is the process of gradual growth of the average annual temperature of the

surface layer of the Earth's atmosphere and the World Ocean, due to all sorts of reasons (increase in the concentration of greenhouse gases in the Earth's atmosphere, changes in solar or volcanic activity, etc.). Global warming will change the habitats of many species of terrestrial and marine flora and fauna. The most large-scale changes will be felt by the indigenous peoples of the North, whose life is inseparably linked with the natural environment. As the permafrost is thawing, the threat of destruction of buildings, roads, pipelines, airports, and other infrastructure increases, which in a number of cases will lead to significant economic losses, deterioration in the quality of drinking water supply, social tension, forced migration, and, as a result, an increase in the number of infectious and noninfectious diseases, including mental disorders and psychosomatic and addiction diseases. Indigenous peoples of the North are the most vulnerable category of the population to the climate negative impact in the Arctic. Limiting the possibility of using bioresources as a result of hunting and reindeer herding, fishing, and gathering, as well as reducing the safety of movement when the parameters of ice and weather conditions change significantly, increases the risks to health and life and, possibly, in the future, threatens the very existence of some nationalities and cultures.

Gradually, in countries the understanding comes that the nature is the original environment of human life, but not capital, which should be used in economic circulation. Preservation of this environment is becoming one of the main tasks of state policy based on the principles of energy efficiency and resource saving. For example, in the Russian Federation, such basic documents as the Strategy of Ecological Safety of Russia [1], the state program on energy efficiency and development of energy [2], etc. were adopted. However, despite the billions of dollars invested by developed countries in greening the economy, the development of innovative technologies, and the reduction of greenhouse gases, there are still no visible effects on a global scale, and in fact the world is facing a degradation of the natural environment. As Nobel laureate academician Vladimir Kotlyakov notes, our planet is experiencing an era of global warming. The increase in global air temperature in the last century was slightly more than 0.7°C. However, over the past 30 years, this growth has increased, which is especially reflected over the continental regions of Eurasia and North America and most of all in the Arctic [3]. The current model of the functioning of the world economy allows us to make disappointing forecasts: the growing population of the Earth will be able to supply the products of consumption only with the increase of production, the improvement of technologies, and, unfortunately, the destruction of the biosphere.

Figure 1 demonstrates the anomalies of temperature values in the Northern Hemisphere, including the Arctic. This gives grounds to predict the increasing influence of negative factors on the ecosystem of this region, as well as on the life of the indigenous population. Certainly, climate change is a particularly important issue in the context of the development of the Arctic and the indigenous communities that inhabit it. Indigenous peoples also have their own observations related to climate change, since no one can see better what is happening now in the North, and there are significant shifts in their strategies for adapting to these changes. Traditional knowledge is a valuable resource that can and should be used in various fields of exploration and development of the Arctic. Unfortunately the representation of indigenous peoples in international governance structures does not guarantee that traditional knowledge is entirely engaged in evidence-based policy making and that traditional knowledge is not always valued as an equal source of knowledge by some relevant scientific bodies [4]. Hundreds of years of tribal communities' observations over the changes in the Arctic, the formation of ideas about the laws of nature, beliefs in the "living land of ancestors" give today the opportunity to transform traditional knowledge into the daily practice of government, business,

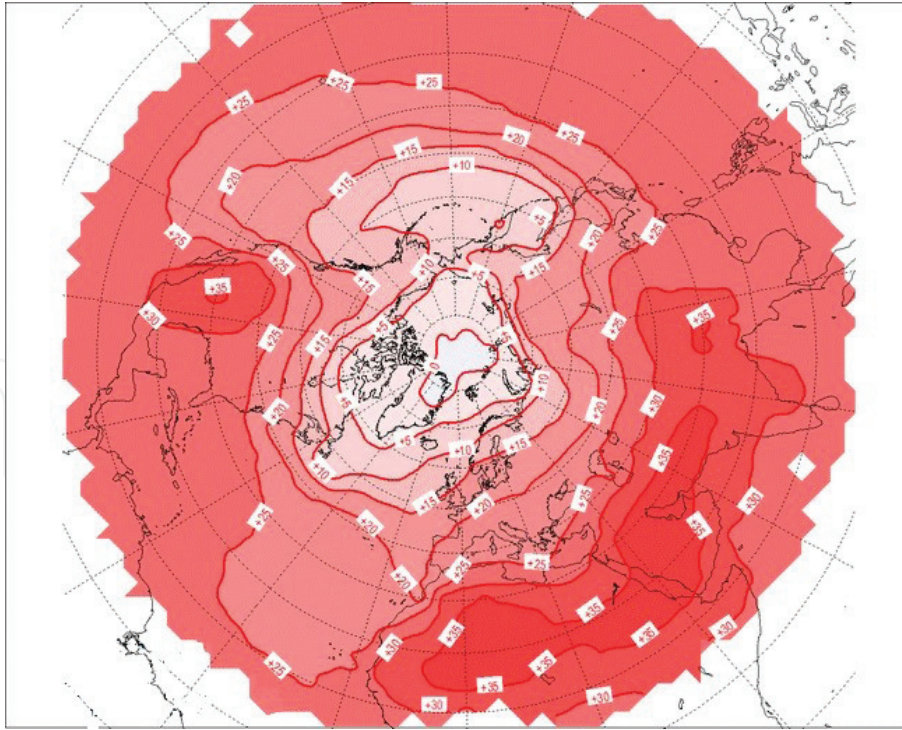


Figure 1.
Map of monthly values and anomalies of meteorological values in the northern hemisphere for June 2018
(source: <https://meteoinfo.ru/anomalii-tabl3>).

and scientists in the extreme North and integrate it with modern technologies. According to the Paris Climate Change Agreement, indigenous peoples and local communities are recognized as the important actors in building a world that is resilient in the face of climate impacts [5].

2. Factors, risks, and challenges to the indigenous communities in climate change in the Arctic

We can rightly call the Arctic zone a “locomotive” of the modernization of the Russian economy [6]. In this vein, state policy is being drawn up, investments are attracted, and projects are being implemented to extract natural resources (gas, oil, gold, rare earth metals, etc.). Almost every one of these projects implemented in the northern regions of the country, one way or another, affects the territories of traditional nature use—the habitat of indigenous peoples of the North. Therefore, the issue of research and assessment of changes in these territories under the impact of climate change and industrial development is very relevant, since it has a multi-factorial specificity, centered on the unique culture of the northern people, its traditions, and its customs. In Russia, indigenous peoples of the North, as a rule, live in the rural areas of the Arctic zone, which population, according to the Federal State Statistics Service, declines annually. Therefore, it is important to study the changes in these territories and develop policies aimed at preserving not only local communities as a carrier of culture and traditions of northern peoples but also traditional economic activities (reindeer herding, fishing, hunting, etc.), since the reindeer herding is the basis of the traditional culture of the North (**Figure 2**).

The future of the Arctic territories is connected, on the one hand, with the expansion of the zone of industrial development and the extraction in deposits and on the other hand the increasing pressure on the unique ecosystem of the Arctic, the changes in the territories of traditional nature use, the transformation of indigenous

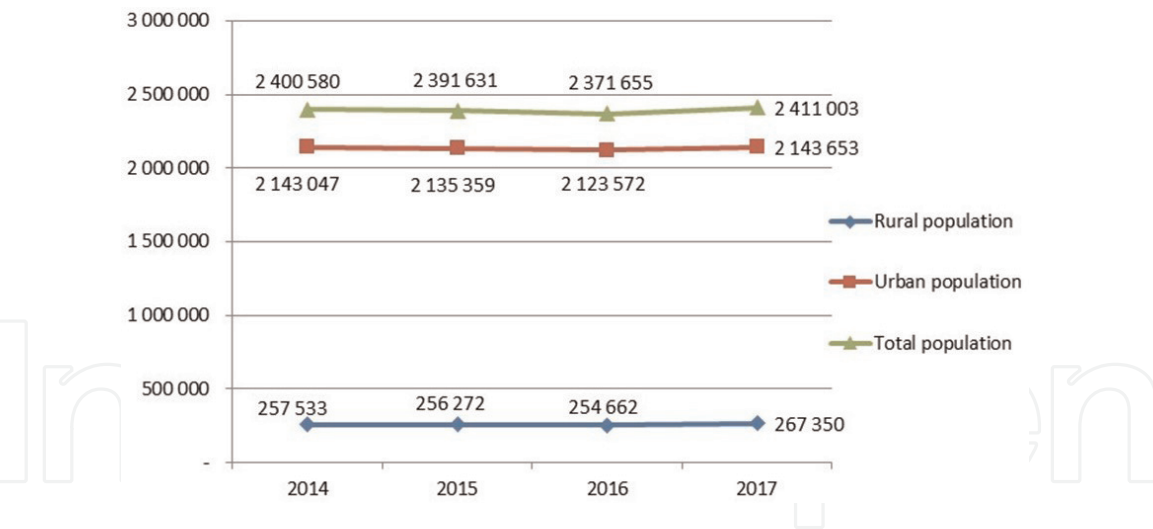


Figure 2.
The numbers of the permanent population of the land territories of the Arctic zone of the Russian Federation as of January 1, 2018 (number of people) [7].

Education organizations, units	1735
Number of medical treatment and prophylactic organizations, units	2045
Number of cultural and leisure type organizations, units	834
Libraries and museums, units	542
Number of sports facilities, units	10,161
Hospitality facilities and accommodation	1123
Shops and supermarket, units	28,364
Restaurants and cafes	3773
Settlements with post office, units	1735
Commissioning of residential buildings, square meters	1,496,550
Number of people living in dilapidated houses	192,411
Extension of a street water supply network, meters	7,566,841.0
Including in need of replacement, meters	2,411,098.0
Number of enterprises for utilization and neutralization of domestic and industrial waste, units	151

Table 1.
Indicators of the social development level of territories of traditional nature use in Siberia and the Far East of the Russian Federation in 2017 [9].

population’s way of life, and tribal communities under the influence, including climate change. In **Table 1** the main indicators describing the territories of traditional residence and traditional economic activity of the indigenous peoples of Russia are presented. This type of territory is located in 21 regions of the Russian Federation with reindeer pastures, hunting grounds and rich fishing opportunities, and gathering of wild plants on a total area of 994.2 million hectares, including lands used directly as reindeer pastures—407.0 million hectares [8].

Climate change leads to the transformation of the traditional way of life and also forces regional and local governments to seek new approaches to managing these changes, allowing them to adapt and adequately respond to emerging challenges. Prospects for the revitalization of the industrial development of the North in the future involve the withdrawal of an increasing number of lands of traditional nature

use for inclusion in economic circulation. Undoubtedly, industrial development of indigenous peoples' habitats at the present time determines the prospects for their further socioeconomic and ethno-cultural development. Considering the strategic nature of the state interests in the Arctic region and the attention paid to the development of deposits in Siberia and the Far East, it is necessary to devote harmonization of interests of industrial development of these territories and preservation of the habitat of indigenous communities, creation of mechanisms for interaction of task forces on optimization of economic, and social and environmental interests of all stakeholders in the territories of traditional nature use [10].

2.1 Climate change impacts on the traditional way of life

The impact of climate change on indigenous peoples is diverse. This is especially reflected in health and the traditional way of life. Health as a factor in the well-being of indigenous peoples worsens, which shows itself in a high level of mortality with relatively high birth rates, problems with alcoholism, and diseases of the digestive system due to poor-quality drinking water. Significant climate change resulting in the increase of natural disasters, abnormal winter and summer temperatures, floods, mudflows, and landslides increases the number of deaths from unnatural causes, injuries, and subsequent health problems. Climatic changes are also the cause of more serious phenomena, as the deterioration of the parasitic and epidemiological situation. Degradation of permafrost in areas where this type of soil has been preserved for centuries, and on the basis of which the habitat of indigenous peoples and their feeding systems has been formed, leads to catastrophic consequences. Moreover, changes in the permafrost sometimes have unexplained causes, which raise an active discussion in the scientific community. So, in 2014 in Yamal, a giant dip of a soil of unknown origin was discovered. A huge funnel was noticed by helicopter pilots who serve the oil and gas fields on the Yamal Peninsula. The fault is located next to the Bovanenkovo gas field (Yamal LNG), one of the largest in Yamal—the place of one of the most innovative projects of modern Russia for liquefied gas production jointly implemented with Italy, France, Japan, and China (Figure 3).

Later Russian scientists from Yamal managed to descend for the first time to the bottom of this dip—to a depth of 200 m. The hole has a cone-shaped view with dimensions of 60 and 40 m. They took more than a dozen samples for chemical analyses, including ice and soil. It turned out that the Yamal “black hole” from the



Figure 3.
Yamal hole in 30 km from the Bovanenkovo gas field. (source: https://www.moya-planeta.ru/news/view/uchenye_vpervye_issledovali_dno_yamalskoj_voronki_8251/)

inside is covered with a layer of ice of unknown composition, which has yet to be investigated in the laboratory. Analyses of air inside the funnel revealed the absence of harmful impurities and dangerous gases—on the basis of this fact, scientists concluded that in a mysterious earthly failure, a new life could arise in time. The scientists noted that they failed to solve the main riddle—how the process of a mysterious holes' formation was going on in the Yamal land. The most authoritative experts consider these holes to be the result of the process of degassing the permafrost due to global warming [11]. Currently, the problem of tundra transformation under the climate change factors is becoming a significant threat to the traditional forms of economic activity, especially reindeer herding. The formation of thermokarst lakes, the degradation of biota, and the waterlogging of significant areas of the tundra during the summer period are risk factors and cause deer to change routes, and in the spring and autumn, a phenomenon such as ice, which is ruinous for reindeer herding, began to increase. Due to the steady increase in the amount of precipitation in recent years, a deeper snow cover is formed, creating difficulties for animals to hoof the reindeer moss. At the same time, the late arrival of colds led to difficulties in the transition of reindeers to winter pastures (Figure 4).

In the northern regions of Russia in recent years, there have been no isolated cases in which thousands of reindeers perished from hunger. The increase in the mean annual temperature is detrimental to the regions of permafrost, where the centers of anthrax are revealed during thawing. In the summer of 2016 on the territory of Yamal, an outbreak of anthrax was caused by an abnormal heat. The most dangerous infection was safely suspended in the permafrost for 75 years. The most objective cause of the outbreak was called climate warming. Abnormal heat in the tundra to +35°C kept for more than a month. Comprehensive measures were taken to protect Yamal reindeer herders from dangerous diseases. All the livestock of the deer are vaccinated; the animals are fitted with chips. Vaccination is conducted among the tundra population and specialists from the risk group: in 2017, about 8.2 thousand people were vaccinated in the region, and the entire number of reindeer and more than 730 thousand animals were vaccinated against

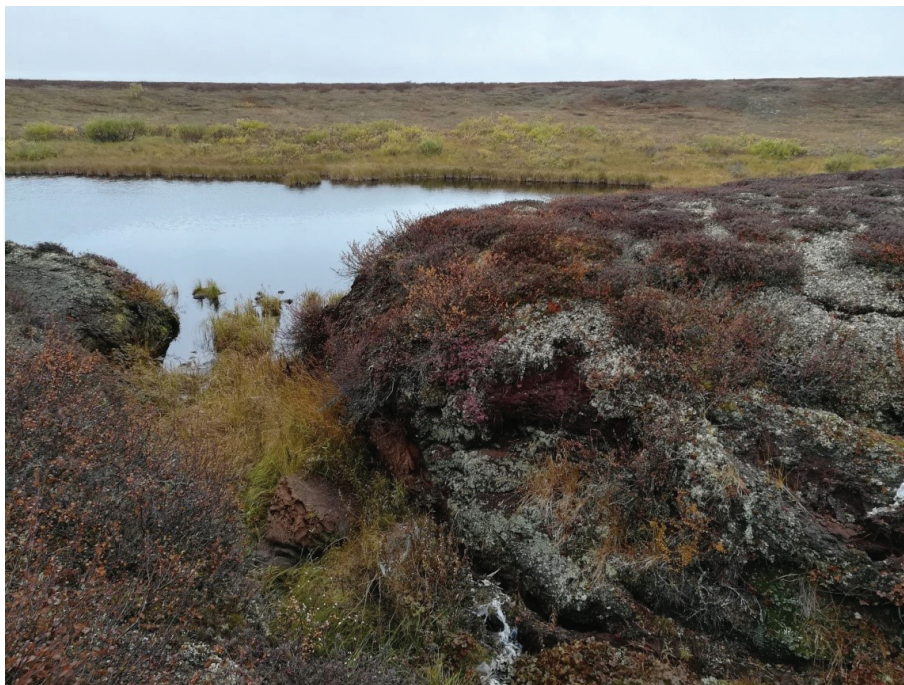


Figure 4.
Thermokarst lake in tundra with landscape degradation near Vorkuta, Komi Republic, Russia (photo: V. Gassiy).

anthrax. Forty-two thousand representatives of the indigenous peoples of the North—14,000 of them live in a traditional nomadic way of life—and the largest reindeer herd in the world live in the territory of Yamal, so the ecological component plays an important role in preserving the traditional economic activities of indigenous peoples [12]. One of the main threats is the change in the water regime of rivers. Most of the modern settlements in the North are located on the banks of rivers. In recent years, spring floods have sharply increased, floods have become more frequent, and the processes of erosion of shores have accelerated, which bring great disasters to the population. For example, in the regions of northern Yakutia, the banks of the rivers Lena, Yana, and Anabar collapse under the influence of high temperatures and melting of permafrost, which leads to shallowing of rivers, a change in the relief of the bottom. As a consequence of these processes, boats of local fishermen cannot sail along the riverbed; the fish does not go far downstream; thus indigenous peoples are deprived of the type of product that forms the basis of their food ration. Reduction of fishing takes place together with a decrease in the level of production of hunting objects (wild reindeer changes migration routes; the number of fur-bearing animals decreases; because of warming, the meat of a wild animal is often affected by a viral infection or parasites), i.e., we are talking about the problem of access to traditional types of resources.

Access to resources is closely linked to security, which is provided by traditional knowledge, accumulated for millennia. But the transformations that are taking place change the reality; the representatives of indigenous peoples are increasing in situations where their practice, experience, and knowledge cannot help them. This leads to an increase in the number of accidents, especially those associated with late freeze-up, ice, and early floods. One of the consequences is the restriction of access to traditional food. In addition to the above factors, one of the reasons is the deterioration of storage conditions. In recent years, the quality of food has sharply deteriorated. So, in the Bulunsky District of Yakutia, local residents often face the problem of phimosis (*cysticercosis*) caught from the Lena River. It should be noted that a similar problem is a characteristic of other regions of the Arctic where indigenous peoples eat fresh or slightly salted fish [13]. In 2016, Federal Service for Veterinary and Phytosanitary Surveillance in the Komi Republic during federal monitoring sampled liver and kidney samples of slaughtered animals belonging to the reindeer herding enterprises of Intinsky and Usinsky districts. Sixty-four samples were examined, of which 52 results were found with excess of mercury—the maximum permissible level was exceeded by 0.9 mg/kg—and 43 results with excess of cadmium, the maximum permissible norm is exceeded by 8.3 mg/kg [14]. In addition, in the liver samples, an excess of the normative indices of dioxins was detected—the maximum permissible rate was exceeded by 8.3 times. However, meat and other offal (with the exception of kidneys and liver) do not contain dangerous chemical pollutants and do not pose a danger to citizens. Accumulation of toxicants in the liver and kidneys of animals is due to the physiological properties of these organs, which are biological filters of organisms. Dioxins are formed in a number of industrial and natural processes, for example, in the production of chlorine and pesticides, burning fuel and debris, and forest fires. Cadmium and mercury pollute the environment both for natural and as a result of industrial activities. In particular, heavy metals pollute the environment during the smelting of nonferrous metals and other processes in the mining industry. It is believed that the northern communities of plants and animals tend to accumulate persistent contaminants, as they have a number of properties necessary for this, including the characteristics of the climate (preventing the destruction of substances) and food chains that are distinguished by a small variety of plant and animal species. According to the world scientific data, some traditional food of the inhabitants of

the northern regions of the planet (Alaska, Greenland, Scandinavian Peninsula, Far North of Russia) have a high content of harmful chemicals. Such types of food include meat and fat of marine mammals, reindeer offal, and others [15]. In this way, there are more and more people who are forced to refuse from the consumption of raw fish, which often turns out to be infected with phimosis and other diseases. As a result, the probability of losing certain cultural traditions is growing, since food is an integral part of the traditional way of life and culture.

It is also necessary to say about the impact of climate change on the health of indigenous peoples. In recent years there has been an increase in mortality in the Arctic. Almost every year there are floods, with every third year—with disastrous consequences and deaths. The number of hits to hospitals increased due to sunstroke, dehydration, pressure drop, etc. Surface water pollution increased, both from floods and melting of permafrost. This leads to an increase in intestinal diseases, especially in the period of floods. Also, in Arctic regions, there is increasing cases of oncological diseases [16]. Some experts attribute this to a more intensive chlorination due to the deterioration of water quality. The prolonged exposure to increased concentrations of chlorine and its constituents, according to doctors, increases the risk of cancer. Warming has widened the areas of spread of diseases, the carriers of which are insects or mites that spread to all new territories. One of the main risk groups for climate change is the children. In northern regions, up to 70% of children have deviations in health status. The incidence of children in the northern regions is significantly higher than the national average. Over the past 10 years, they tend to grow. Children of the North and children of other regions are in unequal starting conditions of life. Under the influence of unfavorable climatic factors and polluted environment, the age development of the immune system falls behind in children of the North for 2–5 years. Thus, for indigenous peoples of the Arctic, the warming of the climate and the associated lengthening of the season, during which the sea is not covered by ice, a decrease in the surface and thickness of sea ice, changes in the migration routes of wild reindeer and their food base, and a drop in the number of marine animals may lead to a reduction in traditional craft. This, in turn, will lead to a violation of traditional food. The indigenous inhabitants of Alaska and Greenland, Chukotka, and Yamal are already recording the negative effects of climate warming, which appeared in a decrease in thickness and an earlier opening of sea ice. These circumstances make it more difficult to hunt and lead to an increase in the number of injuries, which is already the cause of a significant number of deaths among indigenous peoples of the North [17].

Figure 5 shows the riverbed of the Anabar River near the village of Saskylakh in the northwestern part of Yakutia. Fishermen are forced to manually drag the boat a few kilometers downstream to reach the fairway (**Figure 6**).

2.2 In a dialog with indigenous communities for better understanding of climate change in the Arctic: the Yakutia case

In 2017, an expedition aimed to the research on socioeconomic and environmental problems of the Arctic indigenous communities was organized by the financial aid of the Russian Fund for Basic Research (RFBR) to the Anabar National (Dolgan-Evenk) ulus (district) and Ust-Yanskiy region in Yakutia. These areas belonged to the compact residents of the indigenous peoples of the North. The study allowed to determine the attitude of the local population to traditional activities and to identify the socioeconomic problems of the territories and environmental threats to indigenous communities in the context of climate change. In the



Figure 5.
Shallowing of the Anabar River in Yakutia (photo: V. Gassiy).



Figure 6.
Collapse of the riverbank of Yana due to permafrost melting, Yakutia (photo: V. Gassiy).

structure of the respondents in the Anabar area, representatives of indigenous peoples were Evenks 43 people (33%) and Dolgans 71 people (55%) (**Figure 7**) (**Table 2**).

It is worth noting that this ratio between men and women, when the number of women prevails, is typical for indigenous communities, since it is associated with the high mortality of men engaged in traditional crafts: hunting, fishing, and reindeer herding. In addition, we can add problems of alcoholism reducing life expectancy, as well as chronic diseases caused by the harsh climate. As a result of the survey, residents of indigenous communities noted the following socioeconomic problems in their places of residence:

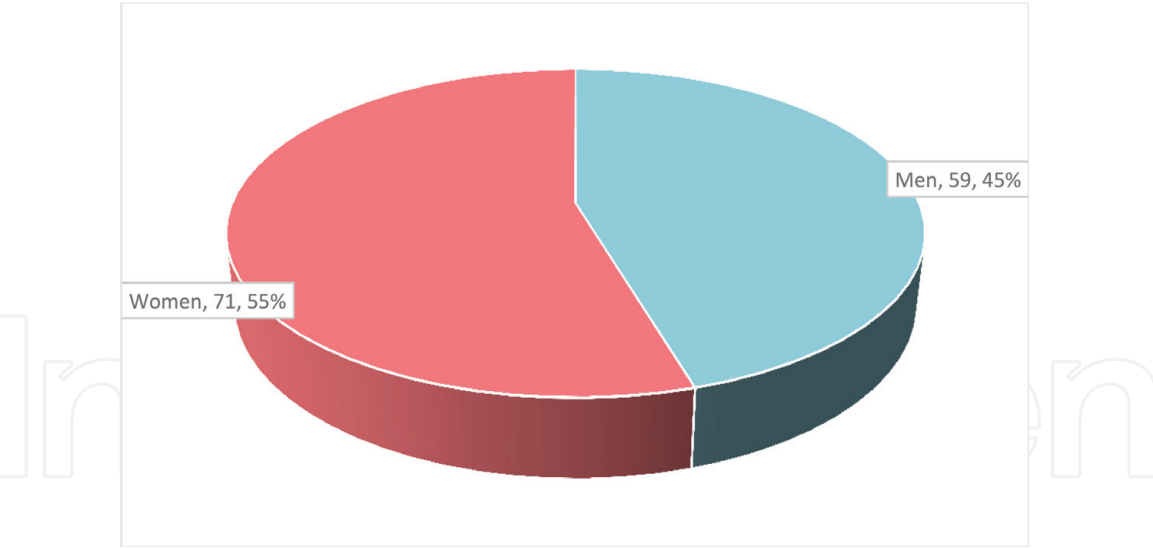


Figure 7.
Ratio of men and women in the total number of respondents.

Indigenous community	Respondents	Share of respondents from the total number, %
Yuryung-Khaya	29	22
Saskylakh	101	78
Total	130	1000

Table 2.
Distribution of respondents who participated in the survey, by settlements in the district.

- 1. High prices for food products, 22.5%
- 2. The lack of jobs, 20.2%
- 3. Low level of income, 19.7%
- 4. Old state of housing and communal services, 19.1%
- 5. Poor transport accessibility, 9.0%
- 6. Low level of medical services, 6.5%
- 7. Low level of equipping educational institutions, 3.1%

As can be seen from the survey results presented, the majority of the respondents connect the socioeconomic problems of the territory with the lack of a stable income, the need for employment, and the underdeveloped infrastructure. In this regard, the implementation of investment projects for the industrial development of territories can create additional jobs for the local population. It should be noted that in the experience of some Russian regions, there are examples of the implementation of a targeted policy for the local labor market development. For example, for several years in the Republic of Sakha (Yakutia), JSC Almazy Anabara (Alrosa group) has been implementing the educational program, which provides training for the company’s interests and the residents of indigenous communities, where an investment project on the extraction of minerals starts. The survey made it possible to determine the list of sociocultural problems that concern the local population:

1. Increase in morbidity and mortality of the population, 20.7%
2. Loss of communication between people and their culture, traditions, 18.3%
3. Alcoholism, 18.3%
4. The lack of organized forms of leisure, 14.1%
5. Problems of selling traditional craft products, 12.3%
6. Outflow of youth, 12.0%
7. Crime rate, 4.5%

It should be noted that the majority of respondents attributed an increase in morbidity and mortality of the population with active industrial development of territories of traditional nature use. However, these are often only subjective assessments, since the problem of early diagnosis of diseases in the Arctic regions of Russia is particularly acute, and not only instruments and specialists are available in the district centers that could conduct regular medical checkups of the population but even a morgue, i.e., in rural settlements there is no way to establish reliably the cause of death. In most cases, early and sudden deaths, the local population refers to oncological diseases as the consequences of the activity of an industrial enterprise in the territory of their living. In the course of a poll among the inhabitants of indigenous communities, it was found that a high mortality rate is also associated with the problem of alcoholism and crimes committed under the influence of alcohol. The traditional types of economic activity associated with hunting and fishing also endanger life: water safety rules are not followed as well as dealing with weapons.

Among environmental problems, the majority of respondents noted the decline in traditional craft facilities, which is directly attributed to climate change (e.g., the wild reindeer changes its migration routes under the influence of this factor and, as in the case of the Republic of Sakha (Yakutia), goes to the Krasnoyarsk Territory). According to observations of indigenous peoples, winters become warmer, which is expressed in heavy snowfalls and increased winter temperatures. This leads to river spill in spring, flooding of villages, and loss of the fishing opportunity in the traditional way, as the fish goes deeper. Flood threatens another serious problem for traditional craft—broken trees, which the river carries, can break the seines, which means that an indigenous individual and his family can be deprived of food. Many of the representatives of indigenous communities also note the man-made factor—pollution of rivers due to the implementation of industrial projects, shipping, etc.

The Ust-Yanskiy region, the second researched area, has specificity concluded in a huge accumulated damage due to a previous gold extractive mine Kular and closed settlements (Vlasovo, Severniy) caused by mass outflow migration since 1998 when this mine was closed. The barbaric way of extracting gold from only the large and medium fractions, the pursuit of the indicators, led to the fact that there is still enough gold in the recycled dumps that can be produced. Since 2017, the license for processing and restoring Kular mine has been transferred to Arctic Capital LLC, which has undertaken the task of eliminating the accumulated environmental damage, recultivation of soil, employment of the local population among indigenous peoples in the newly discovered deposit, and procurement of traditional products (venison, fish, etc.). The concept of social responsibility of business comes to the Russian part of the Arctic, and it becomes one of the few ways to preserve indigenous community and people on the place of their original habitat (**Figure 8**).



Figure 8.

Accumulated environmental damage in Vlasovo, Ust-Yanskiy region, Yakutia (photo: V. Gassiy).

The specificity of the researched territory is its inaccessibility, which has a negative impact on the development of traditional spheres of economic activity. Producing objects of traditional nature use (fish, berries, furs) involves not only consumption for personal purposes but also the need to transport them to the market in larger settlements. The lack of roads and the high cost of transportation by air or auto trucks make economic activity (trade) by-products of traditional nature use almost impossible. In the Ust-Yanskiy area, the main source of income is the extraction of the mammoth tusk, which brings a significant income to the tribal communities and individual entrepreneurs. However, this type of activity requires special training (traditional knowledge, physical form, etc.) and technical equipment (pumps, boats, etc.). Although there are widespread cases of attempts by local residents to obtain tusks and without the necessary equipment, which leads to lethal incidents. On average, according to local residents, the “washing” season is about 100 days, for which one well-trained person can collect from 500 to 800 kg of tusks. In monetary terms, such a “crop” can fluctuate from 10 to 15 million rubles or 160,000–230,000 US\$. Moreover, a hot summer with anomalous temperatures is considered by local hunters for tusks as a blessing, since actively melting permafrost itself gives away the hidden remains of ancient animals hidden for thousands of years. It should be noted that in the villages where the main activity is the extraction of the mammoth tusk, one can see expensive modern machinery that local authorities do not always have (**Figure 9**).

The purchased transport equipment allows local residents to develop trade between settlements within the region. Given their remoteness from each other, and the impossibility of year-round traffic, this is an important factor in actually helping people survive in such a harsh terrain. This fact makes indigenous peoples to adapt to the climate change in tundra in a unique way. For example, it is often possible to meet indigenous peoples who are using a winter mode of transport during the summer period, since flooded areas of the tundra do not allow movement on motorized wheeled vehicles, **Figure 10**.

Figure 10 shows a group of Evens moving on a snowmobile to their native village. In their opinion, in recent years the climate in the tundra has changed



Figure 9.
Type of transport vehicle in a Kazachye indigenous community, Ust-Yanskiy region (photo: V. Gassiy).



Figure 10.
Snowmobile in summer tundra on the way to Khayyr (even community), Ust-Yanskiy region, Yakutia (photo: V. Gassiy).

considerably: “Winters have become warmer, and summer is unstable: there can be both hot days and cold months when berries do not have time to ripen” (reindeer herder Nikolai, 43); “The deer goes North and does not come here because of the midges, which is very much due to the heat” (hunter Michael, 52) (**Figure 11**).

As a survey of the indigenous community showed, the traditional economy for the majority of local population ceases to be the basic criteria for determining the ethnic characteristics of the people. The high level of unemployment among indigenous peoples of the North, including the Evenks, Evens, and Dolgans, is complicated by the peculiarities of the sectoral structure of employment and the



Figure 11.
Example of private household in Kazachye (even community), Ust-Yanskiy region, Yakutia (photo: V. Gassiy).



Figure 12.
Rainwater harvesting for personal consumption, Khayyr (even community), Ust-Yanskiy region, Yakutia (photo: V. Gassiy).

qualification and educational level of the economically active population. The succession of generations in the traditional sectors of the North is gradually disappearing. Young people, being witnesses to the everyday, problematic life of the older generation, are of the opinion that work in reindeer husbandry, hunting, and fishing is not prestigious and does not bring sufficient income to create the corresponding financial situation of the family. The studied living conditions of indigenous communities on the territories of traditional nature use testify to the low level of social, communal, transport infrastructure development, which affects the behavior of the younger generation, their desire to go to the city or find work in extractive companies. “The benefits of civilization” in the form of the Internet, social web sources, and public amenities, along with climate changes, form challenges to the traditional way of life, undermining the age-old foundations of tribal communities. The domestic problems of indigenous peoples are one of the main reasons for the reluctance to remain on their land, to lead a traditional way of life, especially nomadic. Often villages in the territories of traditional residence are not provided with drinking water, and the only sources are river, rain water, or snow (Figure 12).

3. Conclusion

Thus, climate change in the Arctic for indigenous communities is not a prospect of the future, but a real threat to the traditional way of life, food security, and their habitat. We believe that ensuring the social status, decent level, and quality of life of the indigenous communities depends on the ways of preserving and developing the traditional economy on a new material, technical, and technological basis. Market relations in reindeer husbandry and hunting are constrained by the peculiarities of the nomadic way of life and the mentality of indigenous peoples. The theory and practice of managing changes in the territories of the traditional nature use of the Arctic require a critical rethinking of established views. In the coming years, new management approaches will be needed to quickly respond to changes in the Arctic territories, as climate change and global warming lead to the biggest social problem—changing the traditional way of life of indigenous peoples. On the other hand, industrial development expands the area of its presence in the Arctic, which creates not only challenges for the indigenous population but also the opportunities to preserve their culture, traditions, and crafts. In this regard, it is necessary to introduce into the practice of public administration the decision-making model for choosing investment projects based on the priorities of local development, the interests not only of the state and business but also of the indigenous communities [18]. Therefore, in order to solve the problem of survival and adaptation of Arctic indigenous communities in the context of climate change, a proactive reaction of science and practice is needed, based on complex sociological, ethno-cultural, ecological-economic, and statistical studies of traditional nature-use territories.

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